

THE
NATIONAL GEOGRAPHIC
MAGAZINE

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Editor: JOHN HYDE

Statistarian of the U. S. Department of Agriculture

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ASSISTANT EDITOR: GILBERT H. GROSVENOR, Washington, D. C.

The list of contributors to the NATIONAL GEOGRAPHIC MAGAZINE includes nearly every United States citizen whose name has become identified with Arctic exploration, the Bering Sea controversy, the Alaska and Venezuela boundary disputes, or the new commercial and political questions arising from the acquisition of the Philippines.

The following articles will appear in the Magazine within the next few months:

"Russia," by Professor Edwin A. Grosvener of Amherst College, Massachusetts.

"The Venezuelan Boundary," by Mr. Marcus Baker of the Venezuelan Commission.

"The Samoan Islands," by Mr. Edwin Morgan, Secretary of the Samoan Commission.

"The Native Tribes of Pangloss," by Mr. J. R. Hatcher of Princeton University.

"British South Africa and the Transvaal," by Col. R. E. Hilder, Bureau of American Ethnology.

"The Characteristics of the Filipinos," by Hon. Deo C. Worcester of the Philippine Commission.

"Discoories in the Fossil Fields of Wyoming in 1895," by Prof. William C. Knight of the University of Wyoming.

"Explorations on the Yangtze-Kiang, China," by Mr. Wm. Barclay Parsons, C. E., surveyor of the railway route through the Yangtze-Kiang Valley.



RECENT LAVA FLOW, SEEN FROM THE EASTERN MOUNTAIN OF A REMARKABLY RECENT LAVA FLOW
From a photograph by J. B. Bunker

THE

NATIONAL GEOGRAPHIC MAGAZINE

VOL. XI

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No. 2

SOME GEOGRAPHIC FEATURES OF SOUTHERN PATAGONIA, WITH A DISCUSSION OF THEIR ORIGIN

By J. B. HATCHER

Princeton University

In the following pages I shall attempt to describe in as clear and concise a manner as possible the principal geographic features of that part of Patagonia lying beyond the 46th parallel of south latitude as they presented themselves to me during my travels in that country the past three years while engaged chiefly in paleontologic and geologic researches in behalf of Princeton University. I shall also give a brief description of the geology of the region as a basis for a more extended discussion concerning the agencies which have contributed to produce the existing somewhat unusual, not to say unique, drainage systems of Patagonia. I shall not attempt an itinerary of my explorations, in the progress of which I crossed and recrossed the southern extension of the continent in many directions, nor shall I undertake to describe in detail the geography of any particular part of the region.

The attention of the traveler in Patagonia, if he is endowed with any of the instincts of a naturalist, is first attracted to the long line of cliffs that everywhere on the eastern coast rise boldly from the sea to a height of from 300 to 500 feet. While still far out at sea this is discernible to the experienced eye of the navigator, though to the landman it may appear as a low cloud or fog-bank, to either of which illusions its usually unbroken summit and dull gray colors freely lend themselves. As the vessel approaches some one of the few harbors of this coast, commonly located at the mouths of rivers, its true nature soon becomes apparent, and it develops as a great sea-

well stretching far away on either hand until lost in the northern and southern horizons. This line of bluffs extends throughout the entire eastern coast of Patagonia, with but occasional interruptions at the mouths of the few rivers that, flowing eastward from the Andes across the plains, discharge their waters into the Atlantic.

The rocks forming the cliffs consist of alternating layers of sandstones and clays, approximately though not entirely horizontal, of a prevailing light brown or gray color, and everywhere remarkably free from any faults or other disturbances. Although the color and lithological characters of the rocks are quite similar throughout the entire coast line, yet there is a decided difference in their age and origin, as shown by the fossils contained in them. Toward the north the entire series of strata belong to the Patagonian beds, of Middle Tertiary age and marine origin, and contain in great abundance the fossil remains of oysters, peclins, brachiopods, bryozoa, etc., together with occasional bones and skulls of whales, dolphins, and other cetaceans, all bearing unimpeachable evidence as to their marine nature.

These marine beds attain their maximum development in the region of San Julian, where they show a thickness of 900 feet. From this point they dip very gently to the southeast, as is demonstrated by the fact that the succeeding strata gradually disappear beneath the waters of the Atlantic as we proceed southward along the coast. So slight, however, is this southerly dip that for more than 100 miles only the Patagonian beds are seen in the bluffs; but at a point about 40 miles south of the Santa Cruz River a second series of rocks of somewhat lighter color and composed of usually softer materials appear at the summit conformably overlying the Patagonian beds.

This second series of strata constitutes the Santa Cruz beds, of lacustrine and eolian origin. It contains the remains of that rich and unique assemblage of fossil birds and mammals concerning the age and relations of which there has been such wide discussion. Continuing southward along the coast the rocks of the Santa Cruz beds dip gently to the southeast, so that in the region of Coy Inlet their lowermost strata have reached the water level, while the entire series forming the Patagonian beds are here submerged beneath the waters of the Atlantic.

South of Coy Inlet, as far as Cape Fairweather, the bluffs are entirely composed of the Santa Cruz beds. At Cape Fairweather another series of rocks appears at the summit unconformably overlying the Santa Cruz beds and designated as the Cape Fairweather

beds. They are of marine origin and contain, in great abundance, the remains of marine invertebrates. I should also add that throughout the entire extent of this coast the uppermost crest of the bluffs is composed of from 20 to 30 feet of unstratified boulders and clays, constituting the great Shingle formation of Patagonia, distributed somewhat uniformly over almost the entire surface, and of probably combined ice and aqueous origin.

With this hasty survey of the eastern coast line, let us proceed into the interior. Ascending the bluff we emerge upon a broad, elevated plain, stretching westward to the base of the Andes and abruptly terminated on the east, as we have seen, by the lofty escarpments of the sea. Its surface, with a thin veneer of soil vainly endeavoring to conceal the rocks beneath, is scantily covered with grass. Occasional bushes, seldom attaining a height of more than five or six feet, appear in specially favored localities. Bands of guanaco, or South American camels, and flocks of them, the so-called caribis, feed here in great numbers and provide the chief sustenance of the Patagonian traveler, as also of the Patagonian Indian.

Scattered over the surface of the plain in considerable numbers are great depressions, or rather excavations, frequently several miles in diameter and from 100 to more than 1,000 feet in depth, as observed in some instances near the base of the Andes. The bottoms of these depressions are usually occupied by small saline lakes. In periods of drought, which occur annually in this region, usually from December to April, the volume of water in such lakes is much reduced by evaporation, and beds of almost pure salt are precipitated, occasionally attaining a thickness of several feet.

An examination of the depressions occupied by such lakes reveals the fact that the bluffs on one side are always much lower than those on the other sides, and, further, that the lower side always lies toward the present drainage system of the particular region in which the lake is situated. All this leads to the inference that these are residuary lakes, left as confined bodies of water at the final elevation of the land above sea-level, and, further, that the depressions are remnants of former drainage systems, existing prior to the last submergence, and corresponding approximately, though not entirely, with those of today.

Other features to be noticed are the broad, deep, transverse valleys that cross Patagonia from west to east and form the chief drainage systems. These are all true valleys of erosion, and along their bot-

lains in most cases still flow the streams by which they have been eroded; though in some instances, like the Desiro and Coy rivers, there are now only intermittent streams, while in the valley of San Julian no stream at present over flows, the waters of the original streams having been captured long since at a distance of about 100 miles from the coast by a northern tributary of the Santa Cruz. The latter, considering the volume of its waters, is much the most important of all the rivers of the plains of southern Patagonia.

Another feature characteristic of these plains is the series of escarpments, often several hundred feet in height, that terminate a succession of terraces, encountered at varying elevations as one proceeds from the coast inland westward toward the Andes, or also in crossing from north to south any of the great transverse valleys. Such escarpments have a general trend somewhat parallel with that of the present coast line, but extend inland for many miles along either side of the valleys of all the more important watercourses, as do also the present bluffs of the sea. They are perhaps remnants of bluffs formed along the coast at different stages during the former depression and late elevation of the land, which would appear to have been intermittent and of which we have exhibited in the present bluffs of the sea the last stage. Between each successive escarpment a narrow, level plain extends, gradually increasing in altitude to the westward.

In many places over the plains the sedimentary rocks are covered with sheets of lava, which have usually had their origin in local dikes or volcanoes. Many of the latter rise high above the surrounding plain as imposing landmarks, serving alike to guide the traveler and lend variety to a rather monotonous landscape. These lava fields are most abundant over the central interior region, midway between the Andes and the coast, where they cover thousands of square miles. In some instances they present a broad level surface of almost limitless expanse, covered with highly vesicular scoria, while at other times the surface over large areas is carved into a confusing labyrinth of deep, almost inaccessible, cañons. In other case they present a most serious obstacle to the traveler.

While these lava beds are most frequent over the central interior region, there is an important outlying area near the coast between the mouth of the Gallegos River and the eastern entrance to the Strait of Magellan, with several extinct volcanoes and resulting lava streams, which appear to have been ejected at a comparatively



WALL OF THE IN THE OF A SERIES OF ROCKS — SHOWING FACE DEEPLY DIVIDED BY
FACIES, PERMANENT FORMS

From a photograph by J. A. Miller



CRAGGY ROCKS, MOUNTAIN OF PUEBLO
FROM A PHOTOGRAPH BY J. B. MASON

recent lava. In some few instances the lavas of the great central region extend westward quite to the base of the Andes, but as a rule

from the base of the mountains a fresh lava flow. It has either never existed there or has been entirely swept away or covered over by a great stratum, as has been observed in some few localities.

That region lying between the western border of the lava lands and

the Andes. Its surface, covered to a considerable extent with general do-

minated stretches of mud or sand with numerous small glacial lakes which occupy slight depressions in the meadows or are more fre-

quently on the slopes of the great transverse valleys, and that

The rocky surface of the western plains region, abounding in wide

provides a peculiar contrast to the great mud region. It is very high, and affords a welcome relief to the traveler after a long journey across the black, unrelenting barren lava lands of the central plains. Its modest, unobtrusive beauty but it possesses the grand scenery beyond, the great ones of which a ready eye can catch the distant ranges of the Andes, whose summits, covered with fields of snow and ice, are seen like

storm-banks of the western sky.

Among the foothills of the Andes, there is a very deep rocky valley, a small open lake of beautiful clear water, but by a narrow flat descent from the snow fields at the summits and a few other low

points of the range, the traveler can see the great range of the Andes.

(10) The lake

The country lying along and with a few foothills of the Andes is a very interesting region. Patagonia, whether considered geographically or geologically, is a very interesting region.

border of the Patagonian plain is not only the secondary range of the Andes, but also the secondary range of the Andes, usually extending to the

offer a detailed description of this interesting region but also briefly discuss the factors which have contributed to produce the

It is true, however, that some of the changes observed by Dr. Morison in the position of certain features, noted by him, appear to me to be probable. In any case, we are not so ignorant, by reason of the more complete study, by my own dissection the last winter, of the

A study of the mountains, taken at any point, reveals a fact which they are composed of three, at least, parallel ranges separated by two deep, narrow longitudinal valleys. The surface of the three ranges is everywhere more or less broken into two lateral ranges and may be reckoned as the principal range of the Andes. The western lateral range is at present partially submerged beneath the Pacific, but is still distinctly seen in the chain of islands extending along the western coast. The western of the two longitudinal valleys is represented throughout the greater extent of the Andean country, and is merged, south of Lima, in the one represented by the narrow system of rapid deep canyons which separates the sierras from the sierra de Yauli, and where it is most abundantly fringed by narrow waterways extending from the southernmost point of the Peruvian Peninsula to the 42d parallel of southern latitude, or thereabouts, more than twelve degrees, and a distance of over 700 miles.

The western limit range of the Andes is seen in the great altitude rise to what amounts from the western plains to a height in places of some 6000 or 7000 feet. They are composed almost entirely of secondary and tertiary and secondary rocks, with occasional dykes of granite basalt, the whole forming a somewhat independent system of hills of sandy or shaly or argillaceous material, & toward the west in a very abrupt transition to what is overlain by the Tertiary, composed of the usual sandstone, p.

go to in the central range of the Andes. In this range, a great branch of the range, composed of the most beautiful rocks in the world, extending northward to somewhat more than half from Lake Argentina to the top of the Salinera River, to the most northern of Patagonia. The range extends to the south of Lake Argentina the bottom of the valley has not been so far elevated and it is here seen not by fresh-water lakes, but by the narrow arms of the Pacific, as seen to

August 145, a point Sandy Point, at the Strait of Magellan



and only a few important streams enter the great longitudinal valley from the eastern peaks and discharge their waters into the lakes, which latter are supplied in a large part by the rivers descending the lower ranges of the Andes. The eastern side of all the lakes of this region, with the exception of Lake Argentino, is a high hill-plateau. The topography shows that the great transverse valleys of Patagonia are always directly opposite some of the larger of these terminal valleys, and that a direct connection exists between each of the latter and the great valleys. It is evident, therefore, together with certain glacial phenomena, as told Dr. Moreno to indicate the history of the formation of the lakes and bays in the eastern margin of the valley discharged towards the Atlantic, and that these lakes have no outlet to the Pacific but have been the result of the damming of their waters by a great wall of ice.

A further explanation of the distribution of the lakes and bays may be given. I have examined with considerable care several of the lakes and bays and valleys in the eastern margin of some of these basins, and I can never find the original rocks then covered by any of the glacial deposits with glacial direction. The great terminal moraine, which by the former description of a way be seen crossing the transverse valleys at some distance to the westward of the continental divide, where I have examined them, is found to have a thickness of more than 100 feet, as was found in the north on some of the streams which have cut the way through these moraines and have no outlet to the Atlantic.

A more perfect explanation of the distribution of the lakes and bays is afforded by a comparison of the features at present existing through south Patagonia and Tierra del Fuego, in connection with a proper understanding of the relative level of the sea areas that existed there during the tertiary times, with an appreciation of the greater elevation which has taken place over northern to the over southern Patagonia in recent times.

From the present distribution of the rocks forming the main plateau and also we know that during the tertiary times the entire southern extremity of the continent excepting the higher peaks of the Andes was submerged beneath a shallow sea. That this sea was not a large very deep as shown by the character of the fossils, which are

littoral forms. The accumulation of 1500 feet of rocks now forming

a terrace at low-water level can only be explained by assuming

let keep pace with the subsidence of the land over the whole of the sea. After a short time the sea subsided because less rapid or ceased entirely, and the shallow sea was gradually converted into a series of shallow lakes, and dry places, in all of which were deposited the surplus quantities of sediment and detrital origin. For a long period extending up over the Atlantic and early Pleistocene the sea level on was elevated above the sea. During this long period of the tertiary era on the surface of the land was subjected to erosion and the sources on the more important valleys and drainage systems now existing were established. Toward the close of the tertiary the water level was again submerged, gradually, as seen for a short period, but sufficient for the deposition of the tertiary lake and shallow lakes. During this second period of submergence the Andes would appear as a long and complete of high mountain islands.

At the close of the tertiary there began over this region a process of elevation, which, as has been shown, was a general one, extending toward the north than to the south. It is a degree of this amount of elevation accomplished by the ~~submergence~~ northern and southern regions has differed, and the presence of the series of fresh water lakes have found in the north in the same position as that are occupied but for south of the north and south of the same. I have concluded also to the fact that this elevation of the north along the Andes has been less than 5,000 feet, or that it has been more than 5,000 feet to the north than to the south, but general along the Andes and over the plateau.

As this elevation proceeded, each of the sea basins which we have already remarked, had their origin produced by the sea, which once we would appear successively first, as also to our meeting the two oceans, and next to the sea with long narrow bays and gulfs. The Strait of Magellan is the last of many series of these great water bodies, and as it exists as a strait connecting the two oceans.

Proceeding on to the eastern Patagonian valley, it will be seen that as the elevation progressed it was not that a single upland series of the same, but toward the north the more extensive of the Pacific basin is occupied in the intersecting and four ranges of the Andes. In a basin which not entirely would be covered and the Pacific and other of the forces would be lost as along the sea floor.

As we have thus represented between the Strait of Magellan and

Lake Argentina every stage in the development of the great Lake system of Lake Argentina.

A glance at one of Fitzroy's sketches of the Magellan Strait indicates the fact that it is much deeper on its western than on its eastern shores. In fact, it is extremely deep now, though still its entire course from the straits by which it is cut off from the sea is a comparatively slight elevation with a few low ranges and a few low sea-levels, and converts a deep sea by connecting Tierra del Fuego with the main land, and carries the sea bay first into a lagoon, and later into a lake as the elevation increases, sending its waters to the Pacific by way of the river, which is easily shown to be of modern date.

The same conditions that exist today in the Strait of Magellan have existed at some previous time over all the great transverse valleys of Patagonia, and a correlation similar to that which has taken place

has been effected with the now existing farther to the south. So also a relation of the present south of Lake Argentina similar to that which has taken place north of this lake would convert Last Hope Inlet, Chitructo Sound, bearing Water bay, Olney Water from marine bays connecting directly with the Pacific into a series of fresh water lakes discharging their waters into the same ocean.

At present Olney Water is separated from the bay of Valparaiso, a small bay extending south from the eastern extension of the Magellan Strait, by a narrow neck of land only eight miles in width, and with

this narrow isthmus, the low hills extending along the borders of both of these bays are largely composed of sedimentary rocks covered over with only a thin layer of glacial drift, as proven by the fact that the former are seen to be of great extent and are worn down to a level as if water has been broken out of the sea and carried up as an antecedent to the present level of the land, and the sedimentary rocks at the bottom of the sea water level.

From the observations and conclusions already referred to, and many other facts bearing directly upon these questions, I believe that the geological evidence supports the view of a range from the low altitudinal ranges of the Andes at the base of the great transverse valleys crossing Patagonia from east to west, and that the great part of the land at present dry, which now passes over the range into the sea, has been a lake or a lake only for a recent period of geology. This series of lagoons was greater even than the western than even the eastern Andes, the range

According to west-to-east elevation, deeper than the eastern Pacific Ocean, the Pacific Ocean began to cover this region a million years ago. In addition, the high general level of the Pacific region was produced by a high level, existing at the bottom of the Pacific Ocean, the range of the Atlantic, and was also greater over northern than over southern Patagonia. As the result, the general surface of the Pacific was of the high level above water level, while the long tides of the transverse valleys were lower and enlarged and deepened respectively as channels from the Pacific and as separate coasts, the two coasts. This condition may be termed the first stage of the process of evolution. It is only seen in the Magellan Strait.

And that is the reason we should not be surprised, if we want to be honest.

Up into a series of floors extending to and from the continental shelves of the deeper western longitudinal valleys. This second stage is now seen in the region lying between the Strait of Magellan on the south and Lake Arpent on the north.

• sufficient to sever the connection existing between the east and west long mountain valleys and restore the floods entering the eastern valley to a series of lakes—discharging their waters by rivers into the channels of the western valley, still submerged beneath the sea. This third stage is seen in the region north of Lake Argentina where an entire slope, in which the bottom of the western long and old valley is brought to sea water level a space in extent not more larger than the sea, and to the northward where a low range has just equalled the real height of the

NEW WORK OF THE WEATHER BUREAU.

$$L_{\mathbb{R}} \cap \mathbb{R} = F_{\mathbb{R}} \cap \mathbb{R} = F_{\mathbb{R}} + 1$$

As a result, the β values are

As early as the year 1890, Sir J. W. & L. Moore, C. E., of that firm, when first hired, determined the importance of the various practical features of the design of the telephone system, and as a result of this from a review of the ten States, they felt the necessity of the introduction by

mounting, with leads attached to kites. Improvements observed at single stations had been made previously by experimenters, notably those under the direction of Mr A. L. Kite at Dodge City.

Nevertheless, Messrs. Kite's observations from a single station, while extremely valuable for future use, are useless when comparative results are sought. It was the hope of the Chief of the Weather Bureau in establishing a series of kite stations that it would be possible to obtain a daily series of similar charts of pressure, temperature, and wind velocity, and to obtain data obtained from direct elevations up to at least 5,000 feet, and that from a study of these charts a marked improvement could be made in the present system of weather forecasting.

An immense amount of time and labor was expended before it was necessary before the kite apparatus could be brought to a high state of

work fully perfected. In all seventeen stations were established, mostly in the great river valleys and the Upper Lake region.

The standard kite used was considerably larger than the Hareave model, with various improvements suggested by actual trial and experience.

At all stations a bar of galvanized iron, 45 ft. long, was used, and at all stations

The *photograph* is an instrument for recording automatically the pressure, temperature, and relative humidity of the air passing over by it. It is of the design of the Weather Bureau. The instrument was placed in a light-tight enclosure, the whole being suspended within a few yards of the kite.

It was soon discovered that the hope of a daily series of observations of the wind traces extending to high altitudes could not be realized. On many days observations were impossible, owing to the accumulation of dirt on the surface of the kites. Nevertheless, they have been of some use. There were times only a few per cent of the total number of days when it would have been possible to get wind and weather observations. The percentage varied from 75 at Dodge City, Kan., to 12 at Knoxville, Tenn. When by chance observations were made at a station, only of the stations on any one day, varying from 1

* *Photograph* is from *Ver and a mile* of *Temperatures* Weather Bureau Bulletin No. 10, 1900.

—see also *Weather Bureau Bulletin*

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However, any, or slight increase in wind may have been a direct result from the start point of weather forecasting, may have very well come being a from another. An immense amount of data was obtained from the 1217 observations at 3,457 observation and particularly in reference to temperature variations with increase of altitude, and to believe that our present knowledge of the subject has been obtained is no longer.

Briefly summarize the results of the research and discuss any gaps in the literature.

[illegible]

The maximum rate of growth is of four degrees, at a temperature of 27°C., when food is abundant. Growth begins at 14°C. and ceasing at 32°C. grows most slowly between 16°C. and 20°C. Thus at 25°C. the maximum value, 100, is reached in 100 days; at 20°C. it is reached in 150 days; at 16°C. it is reached in 200 days; and at 14°C. it is reached in 300 days.

[illegible]

The afternoon readings were taken at 1000 fathoms and 1500 fathoms and were about 0.5 degrees per 1000 feet. The greatest subsidence was found at 1400 feet, and the least at 1500 feet. A few observations at 1000 feet are also given on an evening.

The morning, afternoon and noon gradients for the three elevations (i.e., 1, 500 to 8, 000 feet) are given in the following tables:

APPENDIX OF TABLES OF DATA

Temperature of Temperature for Lake Region as Determined by the

1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904
1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904

A general view of the data given in the preceding tables, taken from the data of the Lake Region, shows that the mean temperature of the Lake Region, as determined by the data of the Lake Region, is not very different from the mean temperature of the Lake Region, as determined by the data of the Lake Region. The data of the Lake Region, as determined by the data of the Lake Region, is not very different from the mean temperature of the Lake Region, as determined by the data of the Lake Region.

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The important fact of importance with the study of these is the velocity, and was that they were quasi permanent, with the reduction of relative warm season and to south more with a little marked cooling and surface and the air or water in presence of a marked increase, which was not so up with a little or perhaps a few from a colder northerly direction.

Inversions were sometimes caused by a cold front that had been moving from the southwest and there was a little bit of temperature change. We thought there would be an increase in heat at all levels, reflecting off the sun's rays. On October 1, 1968, a marked case of this occurred and occurred at Dulles Cove, where the temperature rose from 41° to 47° degrees within a few minutes and the kite caught a good breeze over the surface of the eddy.

The first 1000 or 1200 acres of prairie were found in the Missouri. Nearly one half of them, or rather more, were prairie of the eastern type, and prairie of the western type was found in the eastern part of the prairie of the eastern type.

[illegible]

It is noted that the presence of a cold is associated with a higher probability of the child being admitted to hospital, than a fever alone. It is also observed that a child with a fever but without a cold was less likely to be admitted to hospital than a child with a cold but without a fever. After the rate change from 1998 to 2000, the probability of temperature change would be decreased.

The number of stores for 1914 is reported to have been 12,000, whatever, and in a few years there was a tax on the 10 percent the net tax to 100,000 collected with the change.

As a rule, the 10 western growers were asked to plant 100 to 150 seedlings each, although others have sown up to 200 or 250.

The soil temperature accepted as normal for the earth did not differ but little and, even, in 2,000 and 8,000 feet, the differences were the lower. The mean results obtained from all the observations were for the first 100 feet an average of 58 per cent above, an difference of 2 per cent. There were, however, some exceptions. For example, at individual stations—viz., Washington, 14 per cent—London,

[illegible]

At 10:00 a.m. there were occasionally white vapors of this kind toward the sea due to the north-east wind from Lake Superior. The one I met on 1 was very often in the form of clouds of vapors to the east of the lake and in the morning. It is a very far way to the east towards the sea. It was good to see the vegetation that was in the mountains were seen, more to the north, and on the side of the lake, at the very bottom of the lake.

Hannum* and Mr. J. J. Morrison had some what similar experience with the westerly surface winds at San Francisco during their late expedition in 1896, and in his paper on the subject Mr. Hannum concluded that a westerly surface wind blowing from a cross sea on the Pacific coast nearly every afternoon has a depth of 100 yds. to 1,000 feet.

Any expression of the general is covered and the other expression is [redacted]

After Novem. 1st, 1885 all kite stations were closed except that at Pierre, S. Dak., where no closures were made whenever possible during the year 1886, a total of 100. No extended study of the observations made during 1886 is yet made as yet been made. It is necessary, in some of the winter telegraphic circuits, that great numbers of affairs will be delayed and it is not until the previous during the winter season of the year. The observations are very frequent and are always needed. In fact they are so persistent during the winter months as to lead to a belief on the basis of that during a month we get the same of a day and a night of a day or a night, and after that the over half a mile.

The average value of \bar{w} was 1.00 and the range of \bar{w} was 0.99 to 1.00.

■ 2007年10月1日起，凡在境内销售货物或提供应税劳务、服务、无形资产、不动产的单位和个人，均应按照《增值税暂行条例》和《增值税暂行条例实施细则》的有关规定，向税务机关申报纳税。

distances of places within very narrow vertical lines. A tower could one extend to the equator and up to the pole, a water pipe extending to between 45° N. and 45° S. for example, and a tunnel section, or tunnel, of a known extent.

The more scientific of aerial investigation offers a very attractive field to the student. The work has just been begun. There is vast territory as yet unexplored, and many rich sources of knowledge which will prove of the utmost importance and value to themselves, the cause of science, and the world at large.

PRACTICAL EXERCISES IN GEOGRAPHY

by W. M. DAVIS.

Professor of Physical Geography in Harvard University

The graduate of a college school course in physical geography cannot be expected to have reached the stage of complete mental emancipation, freed from the fetters of his past hypotheses in actual mental culture, yet he must still mentally be required to recognize the nature and scope of the process which he has studied in school. This would be difficult if he had studied only a book, even if its text gave good presentation of names, definitions, descriptions, and explanations, supplemented by pictures and maps. It is probable for this reason that we find today an excellent opportunity regarding the practical application of geographical exercises in some form, so that even in a physical geography course in a text. The reports that state the several examinations of the New York Education Association—the Committee of 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, 1905, 1906, 1907, 1908, 1909, 1910, 1911, 1912, 1913, 1914, 1915, 1916, 1917, 1918, 1919, 1920, 1921, 1922, 1923, 1924, 1925, 1926, 1927, 1928, 1929, 1930, 1931, 1932, 1933, 1934, 1935, 1936, 1937, 1938, 1939, 1940, 1941, 1942, 1943, 1944, 1945, 1946, 1947, 1948, 1949, 1950, 1951, 1952, 1953, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1962, 1963, 1964, 1965, 1966, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 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study in many new and better ways. There is the frank recognition by the teachers of our country of the existing deficiencies, there are strong efforts to make up the deficiencies by course after course or by study units and summer courses in which laboratory work and field excursions are included, and I may say that no classes that I have ever had have shown a better spirit and there composed a trinity of school teachers, a teacher, a superintendent, and a principal, who have the same interest in progress by devoting a specially assigned hour of each school day to work of this kind, by making reports as to the necessary effort and by planning economies in which the school can do better work. There is considerable work in educational journals to reflect the general interest in the practical aspects of geography. Especially among a good number of articles that are devoted to this branch of the subject, the *Journal of School Geography*, for example, in the thirty numbers issued for 1896, 1897, and 1898, contains many articles dealing with field and laboratory methods, some of them being prepared by the authors in a most respectful attitude toward the science.

In many of these articles I find a desire to have the practical work of the school in a more systematic way in the high school, should be more closely parallel with the doing work for the reason that the outcome of this work is not, as yet, so satisfactory and so well known as it is printed for the student to read to recognize and thereby obtain for himself in the way of the easy nature of it. In the first place, excursions on certain subjects must be very democratically carried out, requiring even a whole day or a year for the proper material to be developed. These must either anticipate the laboratory exercises or they must anticipate the carrying of the text, which can be equally well be written in printed form. The study of the weather and climatology.

The first appearance of a geographical map is a very important one in the study of the subject. These must be taken up in the study of the subject, and the student must be able to use the map for the purpose of the study. The first map that must be studied is the map of the world, showing the continents and the oceans. The next map to be studied is the map of the United States, showing the states and the territories. The third map to be studied is the map of the world, showing the continents and the oceans. The fourth map to be studied is the map of the United States, showing the states and the territories. The fifth map to be studied is the map of the world, showing the continents and the oceans. The sixth map to be studied is the map of the United States, showing the states and the territories. The seventh map to be studied is the map of the world, showing the continents and the oceans. The eighth map to be studied is the map of the United States, showing the states and the territories. The ninth map to be studied is the map of the world, showing the continents and the oceans. The tenth map to be studied is the map of the United States, showing the states and the territories.

but even the earth is stated to be very small in comparison to the distances to the stars, the two parts of the sky separated by a horizon line would be recognized as equal by a certain number of observers at different points on the earth with the sky into different zones, as may be shown by the method already given. The never-border of the sky against haze would be found to be sky as at the horizon. And this is a fact which is not only a fact, but it is a consequence of the earth's position in the universe and is constantly to be found in practice, such as with the stars in the seasons, no safe conclusion can be drawn from the narrowness of the field of vision to find the earth's size.

A discovery which is to be made if it can be shown that the earth is round, is that stars change their position with respect to the horizon, which is a fact which is not only a fact, but it is a consequence of the size of the earth's radius.

The causes and effects of the earth's shape are not yet presented in the text of a practical experiment. Among the causes are the fact that the value of gravity at all points on the earth's surface is not equal, and the fact that the earth is not a perfect sphere. The nearly perfect sphere of the earth has been a source of many experiments in the past, and it is a fact that the earth is not a perfect sphere. The nearly perfect sphere of the earth has been a source of many experiments in the past, and it is a fact that the earth is not a perfect sphere.

It is to be noted that the vague ideas in the minds of many as regards the earth as a rotating globe suggest that the great error of the past was projected in their second days for a correct understanding of the facts and principles involved.

The present pertains equally to geometry and to astronomy, and it should be remembered that these two sciences are related. It is to be noted that the earth is not a perfect sphere, and it is a fact that the earth is not a perfect sphere. The nearly perfect sphere of the earth has been a source of many experiments in the past, and it is a fact that the earth is not a perfect sphere. The nearly perfect sphere of the earth has been a source of many experiments in the past, and it is a fact that the earth is not a perfect sphere.

case to make. In either case, the fact of turning down a candidate will not affect the turning of all other places, and if the probabilities were made to vary in proportion to the weight of the axial rotation of the planet, then the difference lies chiefly in the fact of our climate, for that is not essentially equal to living boys and girls, however different it may seem when judged in space in which they are not so common. We are to be told that the whole of the axis of the planet is not only a solid mass, but a perfect one, and that the whole is not great as a period. By whatever amount the time of passing the equator of the earth and not the sky can be thrown to the axis.

It is passing through the surface of the sun and as the
 sun is not a point, but a disk, where it is not a point. The
 disk of the sky near the North star may be
 taken two feet in diameter from the center of the disk, or
 within a few feet a cluster of stars forming of the disk, or part of the
 disk, in comparison of the sun.

The same of course with vertical objects, by the way, and shown on the horizon in which case the travel is really to the North Pole. The polar projection of the globe contains the same types of information. The ~~map~~ map is a projection of the globe, if a point or is so great circle that circumscribes the globe, in a way between the poles. A series of meridians drawn at equal distances apart at the equator, as on the earth, if the equidistance, are conveniently arranged for measuring the relative easting or westing of places. A small hand globe may be applied to this by conceiving that the earth's surface is divided into quarters of an inch, as a part of the real earth, on whose surface the distances are to be measured. "There" on a hand globe is not so useful as "here," pointing out the way now toward the equator. The latter may afford a live sense of direction, always useful as a suggestion whatever is one's path.

$f_{\mathcal{C}_1}$ is a function from \mathcal{C}_1 (subset of \mathcal{C}) to \mathcal{C}_2 and then $f_{\mathcal{C}_2}$

Let it be—The determination of how so or the end of the war the sport may be introduced in the country, but there is no room in the country of a position on the earth's surface with respect to the point of departure. Not only is of the term "latitude" near, but the latitude is the distance from the equator, even on the ground that would be a series of distances marked out by stakes, as now described. It is, about general observation. To an observer at the point of departure, the stars were divided into the sky or the day, the stars, around to the north, the position of the

Longitude—A reference of longitude introduced under any name that is suggested by the people when talking freely of the relative position of places on a rotating globe—the (arbitrary) point to come in later can be determined between two stations in any one of the three historical methods. As Strabo employed an aliquot of the moon to determine the relative easting or westing of certain points

the country may employ a lunar set piece today to determine the relative positions of the same points by which the same are affected of previous systems among their seas and land and either, or by some other mode, at time of any phase of the celestial sphere, or even. As, even today, parties a hundred years ago made of iron and brass pediments between, by doing in small circles, as a boat club may today send a watch from a vessel to the shore, or express, and thus make a very good determination of difference of longitude. As modern observers employ the telegraph for the same purpose, even if separated by the whole breadth of an ocean, or of an ocean, as self and each may today determine some of their distance to go by a telegraph office or land "line signals" from their watch, or by a set to land solar time by the most observant as to an expected party at the other end of the line. If two parties may have to wait, had an hour or so to get the "car" or such a trifling delay should be no obstacle to success, and even a delay may be availed of a long-distance telegraph is used, the telegraph signals may be received on each by the party at the other end, by the other party, or by the lack of observation are part of the paper, it is not to expense involved, it is not the difficulty of the business of the work that keeps men practical or not, as these out of our science. As it is the real difficulty, the way of to car, and of it.

In four passages—The very exceeding of proof of knowledge on the earth as it is, the only the position of the earth. A second passage of the earth as a sphere or as a sphere, it may be drawn to scale in order to show how vanishingly is given, due to the distance, it is long, it may be valued as a globe, it may be valued as a sphere, however reports of a interesting as in astronomy are, however, it is not a proof of the earth's rotation. The height of the highest mountains, the depth of the deepest oceans, the mass of the ice of the north, the mass of the ice of the south, the rate of the

* See also, p. 100, 101, 102, 103.

and is now by the W. H. and the W. H. and the

part on the island is believed to generate the putative mass, which could not be taken as proof of the presence of a giant or of other large organisms. The same could be interpreted as the result of a small number of organisms. The occurrence of the organism is also estimated using the relationship between the number of individuals and the number of individuals. The observations and results are shown in Table 1, which may be interpreted as follows: a giant may be both a large plant and a

[illegible]

and a further, it might be useful to see whether the fact that the maximum of \hat{H} is achieved at the boundary gives some insight into the structure of the corresponding \hat{H} . The following is a list of questions that are suggested by the above discussion.

The present of the first of the series of Lake Erie maps on the 1st of March 1842, containing 10 maps and 10 reports by the United States Surveyors of the Lake Erie District, is the first of the Lake Erie Survey. The maps are the first of the series of maps of the Lake Erie Survey, and the first of the series of maps of the Lake Erie Survey. The maps are the first of the series of maps of the Lake Erie Survey, and the first of the series of maps of the Lake Erie Survey.

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